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EXAMINER	
NEWMAN, MICHAEL A	
ART UNIT	**PAPER NUMBER**
2609	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/754,013	LEE ET AL.	
	Examiner	Art Unit	
	Michael A. Newman	2609	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-32 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-32 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 05 January 2004 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date 21/Sep/2005, 18/Mar/2005.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Double Patenting

1. A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ... may obtain a patent therefor ..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

A statutory type (35 U.S.C. 101) double patenting rejection can be overcome by canceling or amending the conflicting claims so they are no longer coextensive in scope. The filing of a terminal disclaimer cannot overcome a double patenting rejection based upon 35 U.S.C. 101.

2. Claims 15 - 28 are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 1 – 27 of copending Application No. 10/749,670. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical

Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2. Claims 1, 2, 5, 6, 8, 9,10, 11, 12, 13, 14, 29, 30 and 31 are rejected under 35 U.S.C. 102(e) as being anticipated by Ben-Porath et al. (U.S. Patent No. 6,987,873).

a. Regarding claims 1, 5, 11, 12, 14 and 29, Ben-Porath teaches a method and apparatus for detecting a defect on a substrate, the apparatus comprising: a support for supporting a substrate **(Fig. 18 element 1850 – Col. 8 lines 23 – 46)**, wherein the substrate has a plurality of device units with a same pattern formed on a surface of the substrate and each device unit includes a plurality of pixels **(Fig. 18 element 1830 – Col. 8 lines 23 – 46) [Note that Col. 5 lines 40 – 45 teaches that such a wafer can have a plurality of corresponding patterns]**; a light source for irradiating a light on the substrate **(Fig. 18 element 1820 – Col. 8 lines 23 – 46)**; an image detector for sensing light reflected by a surface of the substrate from the light source **(Fig. 18 element 1890 – Col. 8 lines 23 – 46)**; a reference setting unit for setting a threshold value, wherein the threshold value is digital image data of a specific defect **(Col. 6 – lines 4 – 11) [Note that this corresponds to forming a second image data of specific defects and is performed by the same imaging apparatus discussed above, the setting is done by the processor – Fig. 17 element 1704]**; and a marking unit for marking

a pixel as defective when the digital image data of the pixel is substantially identical to the threshold value **(Col. 6 lines 12 – 14 and lines 51 – 50)**.

Regarding claim 12, notice that the defect footprint **(Fig. 8a element 810)** is defined by upper and lower defect boundaries, 'DB', which are identified in the acquired image **(Col. 6 lines 51 – 56)**.

b. Regarding claim 2, Ben-Porath teaches the method of claim 1, wherein the substrate includes a wafer for fabricating a semiconductor device and the device unit further comprises a unit cell operating as an independent electronic circuit on the wafer **(Col. 1 lines 6 – 11)**.

c. Regarding claims 6 and 30, Ben-Porath teaches the method of claim 5 and apparatus of claim 29, wherein the binary digital data represents a level on a gray scale, wherein the gray scale is distinguishable by a relative density of black and white **(Col. 5 lines 31 – 37)**.

d. Regarding claims 8, 9 and 10, Ben-Porath teaches the method of claim 1, wherein forming second image data of a specific defect comprises observing the substrate surface **(Col. 6 lines 4 – 11) [Note that "acquiring" can be done with a CCD, laser or an SEM (Col. 5 lines 31 – 34)]**

e. Regarding claims 13 and 31, Ben-Porath teaches the method of claim 1 and apparatus of claim 29, further comprising displaying the defective pixel and a defect image on a monitor **(Col. 10 lines 22 – 44)**.

3. Claims 15, 16, 19, 20, 21, 22, 23, 24, 27 and 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Sakai et al. (U.S. Patent No. 7,142,708).

a. Regarding claims 15, 19, 22 and 23, Sakai teaches an apparatus for detecting a defect on a substrate, the apparatus comprising: a support for supporting a substrate **(Fig. 5 element 52)**, wherein the substrate has a plurality of device units with a same pattern formed on a surface of the substrate and each device unit includes a plurality of pixels **(Fig. 5 element 51 See also Fig. 6 and Col. 6 lines 45 – 47)**; a light source for irradiating a light on the substrate **(Fig. 5 element 501)**; an image detector for sensing light reflected by a surface of the substrate from the light source, wherein the image detector generates analog image data for each pixel of each device unit **(Fig. 5 element 504)**; an analog-to-digital converter for converting the analog image data to digital image data **(Fig. 5 element 54)**; a reference setting unit for setting a threshold value and a reference size range **(Fig. 5 element 510 – Col 6 lines 33 – 35)**; a data processing unit for forming first differential image data of a target pixel by subtracting the digital image data of a corresponding pixel from the digital image data of the target pixel **(Fig. 5 element 508) [See Col. 6 lines 9 – 17]**, the target pixel being a subject pixel for detecting a defect **[detected signal]**, and the corresponding pixel being a neighboring pixel that is positioned in a first device unit adjacent to a second device unit including the target pixel and that corresponds to the target pixel **[reference image] (Col. 6 lines 45 – 52)**; a reference setting unit for setting a threshold value and a reference size range

(Fig. 5 element 510 – Col 6 lines 33 – 35), the threshold value being compared with the first differential image data and the reference size range being compared with a defect size corresponding to a specific defect **(Col. 6 lines 9 – 17)**; and a checking unit for checking a defective pixel **(Fig. 5 element 509)**, whereby the first differential image data becomes second differential image data of the target pixel if the first differential image data is greater than the threshold value **(Col. 6 lines 9 – 17) [See also Col. 7 lines 29 – 31]**, and the second differential image data of the target pixel becomes third differential image data of the target pixel, if the second differential image data of the target pixel is within the reference size range, the checking unit checking the target pixel corresponding to the third differential image data as the defective pixel **(Col. 7 lines 50 – 52)**.

b. Regarding claims 16 and 24, Sakai teaches the method and apparatus of claims 15 and 23 respectively, wherein the substrate is a wafer for fabricating a semiconductor device and the plurality of device units are unit cells operating as independent electronic circuits on the wafer **(Col. 6 lines 45 – 47)**.

c. Regarding claims 20 and 27, Sakai teaches the method and apparatus of claims 19 and 23 respectively, wherein the digital image data is expressed as a gray scale distinguishable by a relative density of black and white **(Col. 9 lines 1 – 15) [Note that the values of luminance or lightness correspond to shades between black and white]**.

d. Regarding claims 21 and 28, Sakai teaches the method and apparatus of claims 19 and 23 respectively, further comprising a monitor for displaying the

defective pixel and a defect image **(Fig. 5 element 510 – See Col. 6 lines 35 - 37)**.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 3 and 4 rejected under 35 U.S.C. 103(a) as being unpatentable over Ben-Porath et al. (U.S. Patent No. 6,987,873) in view of Herod et al. (U.S. Patent No. 7,206,442). Hereinafter referred to as Ben-Porath and Herod respectively.

a. Regarding claims 3 and 4, Ben-Porath teaches all the limitations of the parent claim 1 above as set forth in the 102 rejection of claim 1 above. However, Ben-Porath **fails to specifically teach** the use of ultraviolet (shortwave) light as the irradiating light. **Pertaining to the same field of endeavor, Herod teaches the use of ultraviolet light to irradiate a semiconductor wafer for inspection**

(Herod Fig. 1 element 17 – Col. 4 lines 20 – 23). Furthermore, Herod teaches need to replace visible irradiation with UV in order to resolve, at higher resolution, the smaller structures of modern-scale semiconductor wafers (Herod Col. 3 lines 13 – 20). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Ben-Porath by replacing the irradiation light source (Ben-Porath Fig. 18 Fig. 18 element 1820 – Col. 8 lines 23 – 46) with a short-wave/UV source as taught by Herod in order to improve the system's ability to accurately inspect semiconductor wafers with smaller and smaller structures.

7. Claim 7 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ben-Porath et al. (U.S. Patent No. 6,987,873.

a. Regarding claim 7, Ben-Porath teaches all the limitations of the parent claim 6 as set forth in the 102 rejection of claim 6 above. However, **Ben-Porath fails to teach** the gray scale being divided into 256 different levels. Examiner takes official notice that it is old and well known in the art to represent color/brightness pixel attributes (such as gray scale) in 256 quantized steps or levels when using common 8-bit processors, memory and computer systems as suggested by Ben-Porath **(Col. 12 line 50 – Col. 13 line 2). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to represent captured gray scale data using 256 levels**

in order to efficiently utilize the dynamic range of commonly used 8-bit processing systems and maximize digitization quality.

b. Regarding claim 32, Ben-Porath teaches all the limitations of the parent claim 29 as set forth in the 102 rejection of claim 29 above. Ben-Porath teaches using either a CCD or a SEM as image detectors, which are input to a computer system **(Col. 12 lines 21 – 26).** However, **Ben-Porath fails to explicitly teach** that the image detector comprises an analog-to-digital converter for converting the analog image data to digital image data. Examiner takes official notice that it is old and well known in the art to interface a CCD, SEM or similar image capture devices (which capture analog light signals) to a digital computer system as taught by Ben-Porath using an analog-to-digital converter. **Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use an analog-to-digital converter to convert analog image signals captured by the CCD or SEM devices to digital format in order to be able to carry out the required processing on the image data with the computer system taught by Ben-Porath (Col. 12 lines 11 – 20).**

8. Claims 17, 18, 25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakai et al. (U.S. Patent No. 7,142,708) in view of Herod et al. (U.S. Patent No. 7,206,442). Hereinafter referred to as Sakai and Herod respectively.

a. Regarding claims 17, 18, 25 and 26, Sakai teaches all the limitations of the parent claims 15 and 23 above as set forth in the 102 rejection of claim 15

and 23 above. Sakai suggests, as an alternative embodiment, the use of inspection by a DUV (Deep Ultraviolet) **(Sakai Col. 11 lines 30 – 32)**. However, Sakai **fails to teach** motivation for the use of ultraviolet (shortwave) light as the irradiating light. **Pertaining to the same field of endeavor, Herod teaches the use of ultraviolet light to irradiate a semiconductor wafer for inspection (Herod Fig. 1 element 17 – Col. 4 lines 20 – 23). Furthermore, Herod teaches need to replace visible irradiation with UV in order to resolve, at higher resolution, the smaller structures of modern-scale semiconductor wafers (Herod Col. 3 lines 13 – 20). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Sakai by replacing the irradiation light source with a short-wave/UV source as taught by Herod in order to improve the system's ability to accurately inspect semiconductor wafers with smaller and smaller structures.**

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a. Adler et al. (U.S. Patent No. 7,171,038) teaches a substrate inspection system in which defects are classified into types based on the difference signals in two directions.

b. Hung et al. (U.S. Patent No. 7,162,071) teaches a self-learning substrate defect review and classification method in which defects are compared to reference defect images to classify them.

c. Hiroi et al. (U.S. Patent No. 7,133,550) teaches displaying true defects and defect information.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael A. Newman whose telephone number is (571) 270-3016. The examiner can normally be reached on Mon - Thurs from 8:30am to 6:30pm (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chris Kelley can be reached on (571)-272-7331. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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